FLIGHT
The AIRCRAFT ENGINEER & AIRSHIPS

First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER

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DIARY OF FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in the following list:—

April 25.... Aero Golfing Society Team Match, Oxhey Golf Club.
May 31–June 9 Third Czecho-Slovak International Aeronautical Exhibition, Prague
June 15.... Gordon Bennett Balloon Race, Belgium.
June 21.... F.A.I. Conference Opens, Paris.
July 24–Aug. 10 Tour de France for Light 'Planes.
Aug. 4 .... Aerial Derby at Lympne
Sept. 8–18 Light 'Plane Competitions at Lympne

INDEX FOR VOL. XV.

The Index for Vol. XV of FLIGHT (January to December, 1923) is now ready, and can be obtained from the Publishers, 36, Great Queen Street, Kingsway, W.C. 2. Price 1s. per copy (1s. 1d. post free).

EDITORIAL COMMENT.

IN the House of Commons on April 16 Maj.-Gen. Seely made the suggestion, which was welcomed by the Prime Minister, that the time was opportune for steps to be taken to end "the mad race" of aerial armaments. On the surface the possibility of doing so appears alluring, but when one comes to look into the matter more closely it is soon found that this very tempting ideal is as far off as ever of attainment. For instance, there is one point which is apt to be lost sight of in this connection, and that is that, as has been pointed out repeatedly in these columns, it is well-nigh an impossibility for any nation or group of nations to effect a sufficiently close supervision of the air doings of other nations. Limitations may be possible in naval armaments. No country can build a battleship without other nations being aware of the fact, but the construction in large quantities of certain types of aeroplanes can be carried out in secret and the components dispatched to some out-of-the-way place for erecting. Moreover, the cost of an air force is not, or need not be, so great but that even relatively small and poor nations can afford to maintain one of comparatively considerable strength. If an example is required it is provided by Germany during the last few years. Restricted on every hand in the construction of even commercial aircraft, Germany had but one choice, and she took it. She sent constructors abroad—to Holland, to Denmark, to Sweden and, last but not least, to Bolshevik Russia. The supervision rendered possible to the Allies by the Treaty of Versailles was such as to make secret aircraft construction in Germany difficult. But will anyone say that we know all that German designers, constructors, and workmen have accomplished and hope to accomplish in Russia? We think not. If the very special conditions obtaining after the War did not prove effective in tying the hands of one "conquered" nation, is it likely that the aerial preparations of any country with which, possibly, we have never been at war, and regarding which we have no reason to be suspicious, could possibly be effectively supervised?

Disarmament and the Air

Lest we should be thought prejudiced in the matter, and be accused of having an axe to grind, let us see what others think. In a series of articles in the *Quarterly* Prof. Morgan reveals some of the views of the late Lord Morley on armaments, the League of Nations, etc. Thus, when asked what he thought of the Covenant of the League of Nations, Lord Morley is quoted by Prof. Morgan as having said: "I have not read it, and I don't intend to read it. It's not worth the paper it's written on. To the end of time it'll always be a case of 'Thy head or my head.' I've no faith in these schemes."

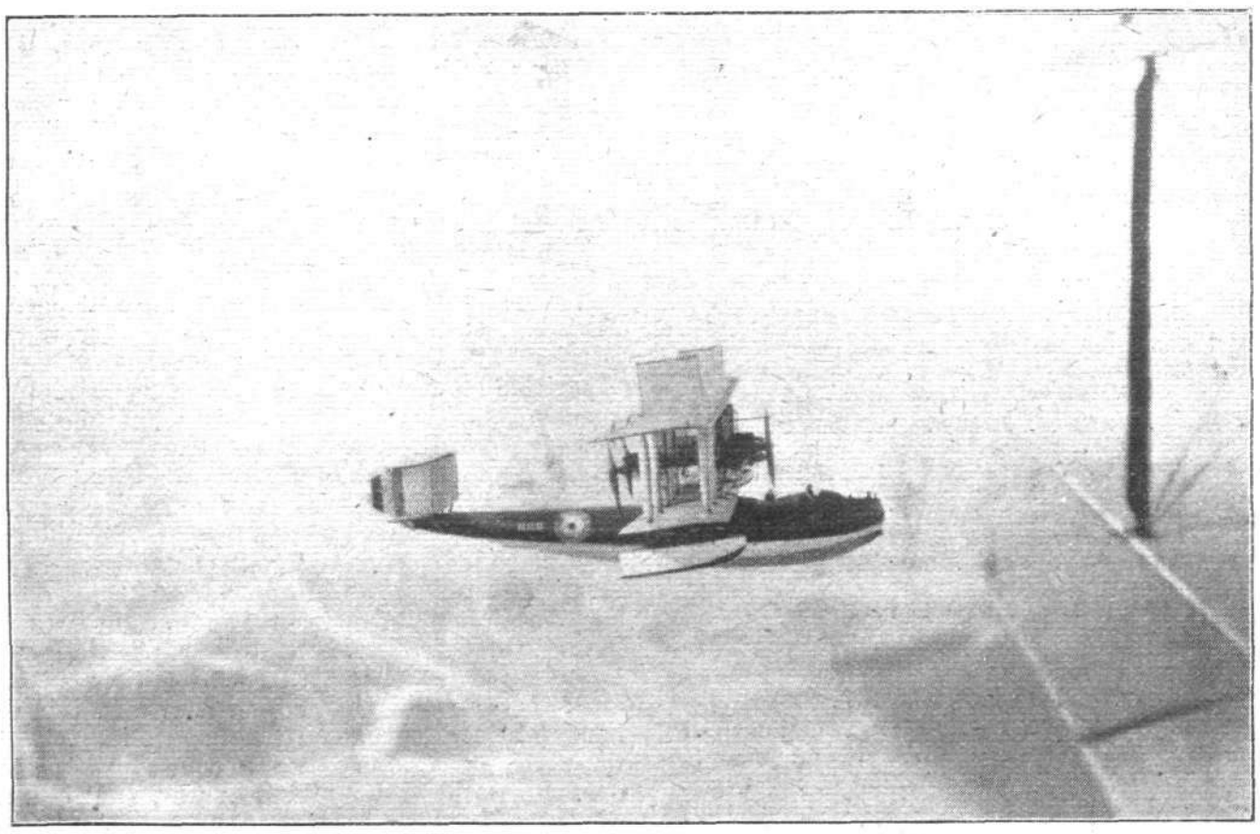
Or again, take the speech of President Coolidge at New York on Monday of this week, April 22. Dealing with another world-conference on armaments, the President said that the Washington Conference did a great deal to restore harmony and good will among the nations, but the question of submarines, *aircraft*, and land forces was still unsolved. Not only so, but the President added that it would appear impracticable to attempt action under present conditions.

Take the case of France. A British mission of distinguished officers has by invitation just spent a week or more studying French air organisation. The mission was divided into four sections, one of which remained in or around Paris to study the technical establishments, while the other three visited the various air stations scattered all over France. The aim of the French was, if we understand it aright, to impress upon the British visitors the fact that the air preparations of France were directed, not against Great Britain, but against Germany. We believe that the British mission was quite convinced of the sincerity of France, and has returned with the best possible feeling towards our gallant Ally. Indeed, no one could seriously believe that France's preparations were directed against us. The point, however, is that France does not believe in the practicability of aerial disarmament, and is taking every step possible to ensure her safety in the air. Surely we, with a far-flung Empire, whose sections are, if anything, more open to sudden attack from the air, can do no less. So long as human nature is what it is it is futile to talk of scrapping our air forces. No country in the world has shown greater willingness to reduce armaments than have we. Our Navy has been reduced in the most drastic manner. Our Army has practically disappeared, and of our once mighty R.A.F. but the merest skeleton remains. The next "gesture" is not due to come from Great Britain.

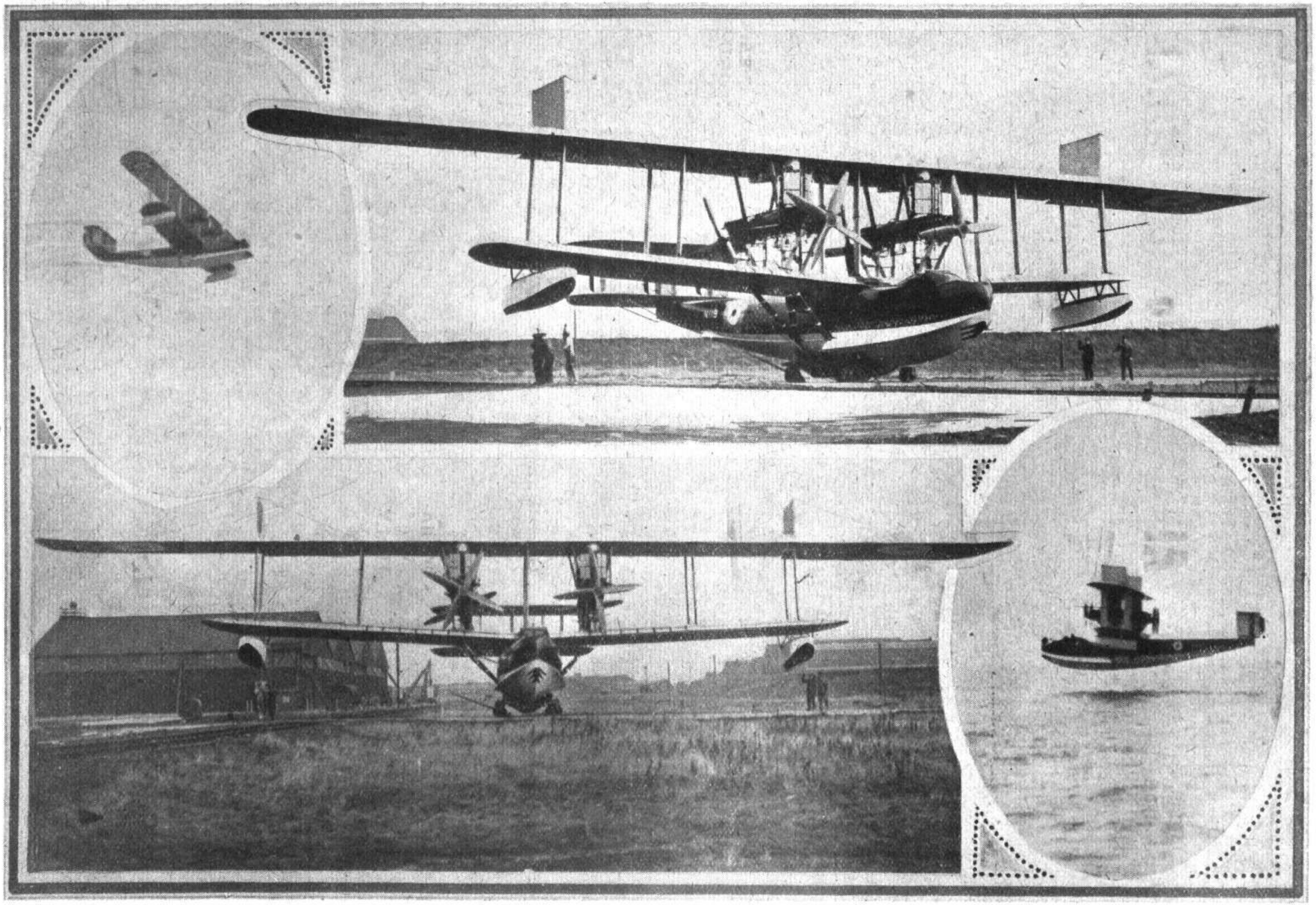
* * *

Three-Engined Aeroplanes

It was at the International Air Congress last summer that several speakers pointed out that one of the most immediately promising ways of attaining practical immunity from forced landings was to fit three engines. Up to the present no British constructor has acted on this view, but tomorrow will, if all goes well, see the placing of an important milestone in the history of British aviation by the official testing of the first British three-engined passenger aeroplane at the Cricklewood aerodrome of Handley Page, Ltd. The machine is fitted with one Rolls-Royce "Eagle" in the nose of the fuselage and two Siddeley "Pumas" on the wings. It is hoped that this disposition will to all intents and purposes preclude the possibility of complete engine failure. The fact that the largest engine is centrally placed will reduce the turning moment when one wing engine is cut out, and it should thus be possible for the machine to keep aloft on any two engines. In fact, it seems likely that the machine will fly on the single Rolls-Royce. Thus the machine, equipped with the latest navigation instruments, turn indicators, etc., should be able to fly in foggy weather. Not only so, but what is at least as important, it should be suitable for night flying. It is admitted on all sides that when night flying becomes possible the value of a commercial aeroplane is practically doubled.



The Fairey "Atalanta" in the air, photographed from another Fairey seaplane.

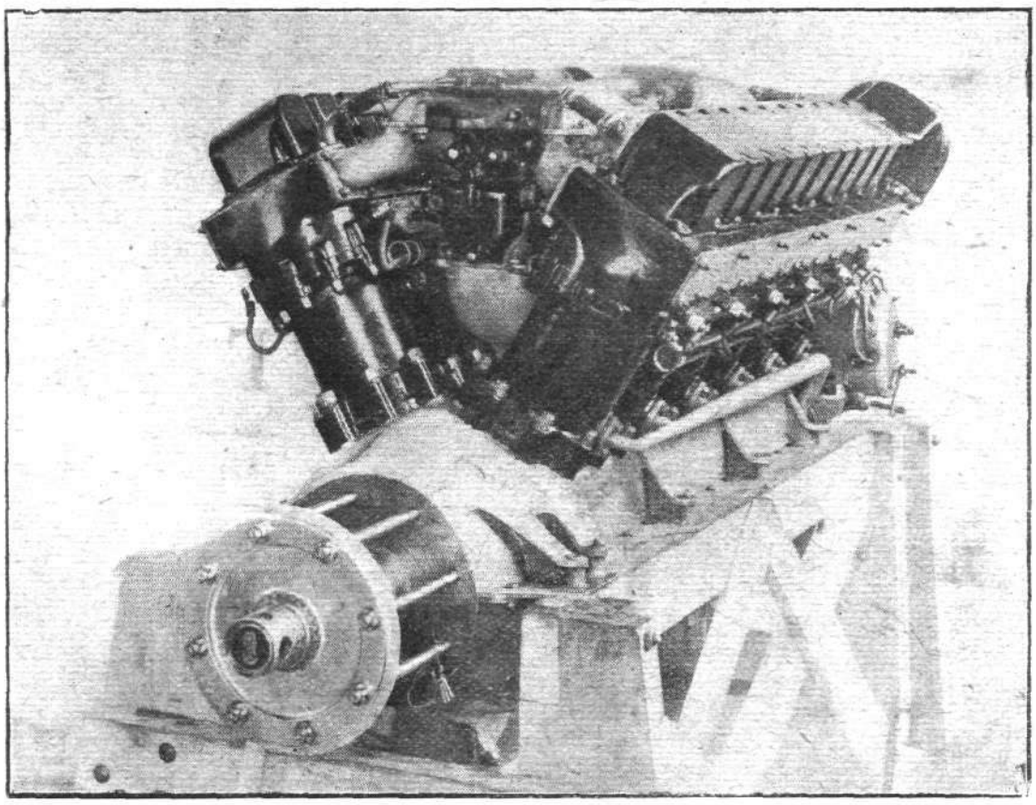


FOUR VIEWS OF THE FAIREY "ATALANTA": This machine, which is equipped with four 700 h.p. Rolls-Royce "Condor" engines, is probably the largest flying boat actually in commission. The type is known as an Open Sea Reconnaissance flying boat.

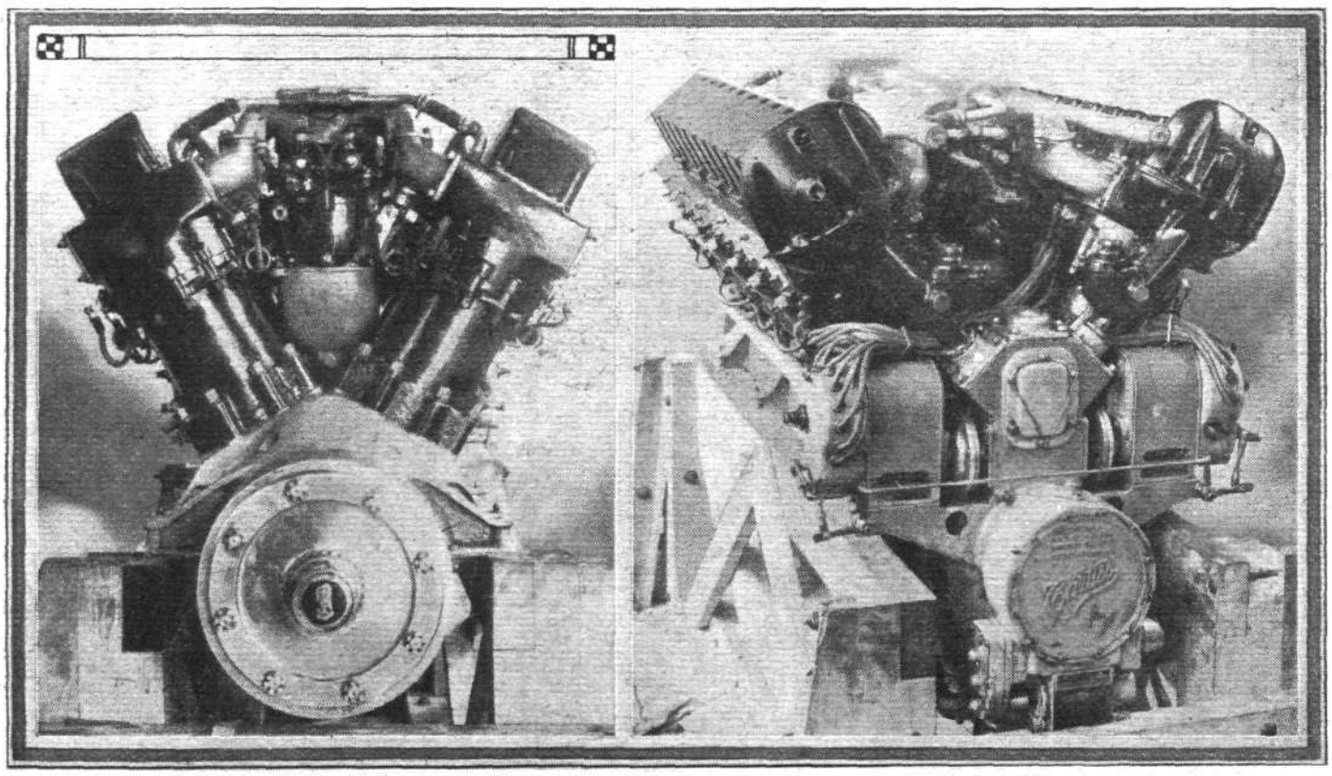
THE 470 H.P. CURTISS D.12 ENGINE

A Water-Cooled Weighing Less than 1·5 lb. per H.P.

SOME weeks ago we were able to announce that the British rights for the Curtiss aero engine had been acquired by the Fairey Aviation Company, of Hayes, Middlesex. Some time ago Mr. C. R. Fairey paid a short visit to the United States, and one of the results was that he brought back with him not only the sole rights for building the D.12 engine in this country, but also an actual engine. Last week we were permitted to inspect this engine at the Hayes works,



The Curtiss D.12 Aero Engine: View from the propeller end.



FRONT AND REAR VIEWS OF THE CURTISS D.12 AERO ENGINE; The small frontal area is well illustrated in the view on the left. The photograph on the right shows how all gear mechanism, drives, etc., are concentrated at the rear end.

and to take photographs of it. These are shown herewith. One feature of the engine which will be obvious from the illustrations is its compactness. The front view gives a particularly good idea of the small frontal area of the Curtiss D.12, and helps to explain how it was that a similar engine (in outside appearance, at any rate, although having a higher compression ratio) could be so nicely streamlined in the Curtiss seaplane that won the Schneider Cup race at Cowes last year. The overall height of the D.12 is 34¾ ins., and the width is 28¼ ins. Add to this the fact that the overall length is but 56¾ ins., and it will be seen that, apart from the question of radiators, the Curtiss packs into a very small space indeed.

Lightness no less than compactness has been attained in the design of the Curtiss, as will be realised when it is pointed out that the weight dry and without accessories is only 680 lbs., while the total weight, including propeller hub and water, is but 724 lbs. As the engine develops (for a compression ratio of 5·7 to 1) 470 h.p. at 2,300 r.p.m., the weight per brake horse-power, inclusive of water and propeller hub, is only 1·54 lb.

The engine which Mr. Fairey brought home with him is not, it should be understood, one of the special high-compression engines used in the Schneider Cup machines. These developed over 500 h.p., and had a compression ratio of over 6 to 1. The present engine is now regarded as a scout engine, and is, as a matter of fact, almost identical with the 1922 Pulitzer race winner. Thus the old saying that the racing engine of today is the scout engine of tomorrow has once more proved true. The engine has, as is of course well known, been developed from the original C.D.12, and its general characteristics are similar to the parent type, although minor alterations have resulted in the vast improvement effected.

In general design the D.12 (which, incidentally, is to be known over here as the "Felix," perhaps because it "keeps on walking") is a 12-cylinder vee type, with the cylinder banks placed at an angle to one another of 60 degrees. The cylinders are of aluminium and cast *en bloc*, thus giving very rigid construction as well as clean design. Steel liners are employed in the cylinders, and are screwed into the aluminium cylinder blocks at the top, while studs projecting at the top and secured by nuts ensure good contact between liners and cylinder heads.

The two Zenith carburettors are housed in the vee between the cylinder banks, the longest of the induction manifold pipes being not more than a foot and the others shorter. The carburettors are synchronised by shafts and toothed quadrants, and universal joints incorporated in the throttle-control shafts. Two Splitdorf magnetos are mounted on the rear end of the engine, one firing the plugs on the inlet side and the other the plugs on the exhaust side.

There are four valves per cylinder, operated by overhead camshafts. Each cam operates two valves *via* a T-shaped tappet yoke, the stem of which works in a bushed hole in the cylinder head. This arrangement eliminates all side-thrust on the valve stem.

At the rear end of the engine are arranged all the drives for pumps, magnetos, revolutions, counter, machine gun interrupter gear, etc., as may be seen from one of our photographs. The hand starter is also placed at this end, and the starting handle is extremely light, weighing but a pound or so.

It is not proposed at present to give a detailed description of the Curtiss D.12 "Felix," as full particulars of materials used, etc., are not yet available, and the engine has not been dismantled. Later on, however, it is hoped that when the engine, after having been given flying tests in one of the Fairey machines, is dismantled an opportunty may be afforded of examining the detail construction and of publishing a fully illustrated description. In the meantime the following particulars may be of interest:

Length of engine over all, 56¾ ins.; height, 34¾ ins.; width, 28¼ ins.; number of cylinders, 12; angle of cylinders, 60 degrees; bore, 4·5 ins.; stroke, 6 ins.; weight complete with propeller hub and water, 680 lbs.; B.H.P. at sea level at 2,000 r.p.m., 415 h.p.; maximum b.h.p. at 2,300 r.p.m., 470 h.p.; economical r.p.m., 1,850; petrol consumption at full throttle, 0·58 lb. per b.h.p. per hour; petrol consumption at cruising speed, 0·54 lb. per b.h.p. per hour; oil consumption, 0·015 lb. per b.h.p. per hour. (The figures for petrol consumption relate to a mixture containing 50 per cent. of benzole.)

Fatal Italian Airship Accident

As the Italian airship N.1 was about to make a trial flight at the Campino aerodrome a violent gust of wind wrenched it from the hands of those holding it down. Four soldiers, however, were carried upwards clinging to the ropes, and one let go when about 60 ft. up, thereby sustaining severe injuries. The other three still retained their hold until some 600 ft. above the ground, when they fell and were, needless to say, instantly killed. Although there were no navigating officers on board, the crew managed to bring the ship eventually to earth.

Belfast-Liverpool Air Service

A DAILY two-hours' air service between Belfast and Liverpool will begin on April 30. Mails and passengers will be carried from Belfast to Liverpool, but only mails and newspapers will be taken from Liverpool to Belfast. D.H. 50 machines will be used, and the route will be *via* Barrow, Maryport, Abbey Head, Wigtown Bay, Luce Bay, Mull of Galloway, over St. Patrick's Channel to Donaghadee and Belfast. Mr. Alan J. Cobham will be in charge of the flights.

Helicopter Records

M. PESCARA, at the Issy-les-Moulineaux aerodrome on Friday, April 18, accomplished a "record" horizontal flight in a helicopter, covering the distance of 736 metres (805 yards) in a straight line from the starting point. The time taken was 4 mins. 11 secs., and the machine remained steadily over 6 ft. above the ground. The flight was officially recorded by representatives of the Aero Club de France. The best flight previously made by M. Pescara, last January, was 600 metres (656 yards).

M. Œmichen, using his own helicopter, on April 17, made a horizontal flight of 525 metres (574 yards) in a direct line at Valentigney. This flight also was officially recorded.

London-Copenhagen Air Service

THE Royal Dutch Air Service Company are, as from the 23rd inst., extending their services between London, Rotterdam, and Amsterdam to Copenhagen. An aeroplane will leave Rotterdam every morning, except on Sundays, at nine o'clock, arriving at Bremen at half-past eleven, Hamburg at ten to one, and Copenhagen at half-past three.

On the return journey an aeroplane leaves Copenhagen at a quarter past nine in the morning, and arrives at Rotterdam at five minutes past five o'clock.

Lisbon-Macao Flight

THE two Portuguese airmen, Capt. Brito Paia and Lieut. S. Beires, who left Lisbon on April 2 for a flight to Macao (China) reached Heliopolis, Cairo, on April 21.

An International Air Conference

AN International air conference will open in Rome on Tuesday next. It will be attended by jurists representing 26 nations, and will deal with such questions as the extra-territorial status of aeroplanes while in flight and rights of landing.

Cause of Lawrence B. Sperry's Death

THE Air Ministry announces that as a result of the investigation into the circumstances of the accident to aircraft G-E.B.I.J., piloted by Mr. Lawrence B. Sperry, which occurred on December 13th, 1923, the Inspector of Accidents arrived at the following conclusions:—(*a*) That the pilot was forced to alight in the sea owing to a complete failure of the engine, and he was subsequently drowned in an attempt to swim ashore. (*b*) That the failure of the engine was due to warping, and consequent seizure, of the valves of the top cylinder, followed by a displacement of the tappet rods.

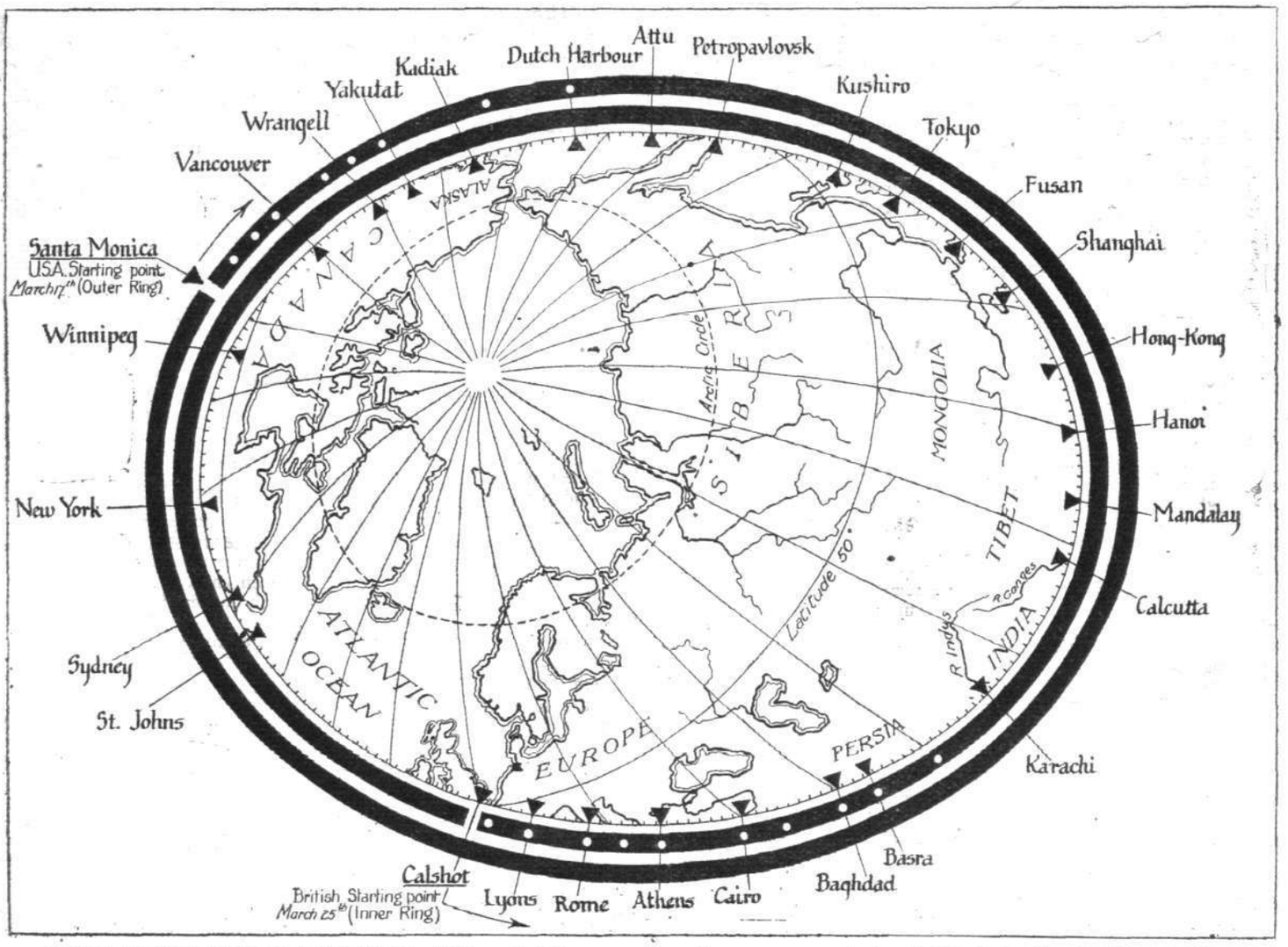
A Gift to the R.A.C. Racing Fund.

WITH the object of encouraging the sporting side of aviation, Mr. Samuel Samuel has contributed a generous and welcome donation of £1,000 to the racing fund of the Royal Aero Club.

Round Australia Flight.

WING-COMMANDER GOBLE and Flying Officer McIntyre, who started from Melbourne on April 6 for a flight round Australia, in Fairey seaplane, got as far as Townsville, Queensland, on Sunday, April 13, and on April 16 reached Thursday Island, N. Queensland. The previous stages covered on this flight were Melbourne-Sydney, Sydney-Gladstone.

ROUND-THE-WORLD FLIGHTS



ROUND-THE-WORLD FLIGHTS: This sketch map has been prepared to show at a glance the position every week of the British and American crews as known up to Tuesday evening. The direction followed by the Americans is clockwise (i.e., east to west), and that of the Vickers "Vulture" anti-clockwise (west to east). The Americans left Santa Monica, California, on March 17; the British crew left Calshot (Southampton Water) on March 25. On Tuesday evening the Americans, except Maj. Martin, had reached Dutch Harbour, while the British were at Bander Abbas.

Good progress has been made by the world-flyers during the past week, only Maj. Martin, leader of the American team, meeting with bad luck, being forced to descend near Chignik on his way there from Seward.

Squad.-Leader MacLaren received his new "Lion" on Monday of last week, and it was successfully installed the same day with the assistance of H.M.S. *Emperor of India*. This was accomplished by the following morning, the engine was given a trial run, and everything was found to be in order, so the machine was forthwith prepared for a resumption of the journey and a trial flight made. On Wednesday morning, April 16, they left Corfu at about 11.30 a.m., and arrived at Old Phaleron, Athens, at 2.45, after an uneventful journey of some 240 miles. The flight was continued the following morning at 11.30 a.m.—a previous attempt at rising from the water having failed. Six hours later they arrived at Heliopolis aerodrome, Cairo—MacLaren's previous station—and effected a safe landing with the assistance of aerodrome flares. Weather conditions on this occasion were ideal, and the journey was without incident. The distance of this log was about 703 miles.

Good Friday was spent in "resting" and making a thorough overhaul, cleaning, etc., of the machine. On Saturday, April 19, they left Cairo, *en route* for the Holy Land, at 6.40 a.m., and, after crossing the Dead Sea, landed at Ziza (near Amman) at 1.30 p.m., having flown a distance of about 317 miles.

The following day, April 20, they resumed their journey early in the morning, and accomplished a somewhat bumpy flight across the Syrian Desert to Baghdad, a distance of about 518 miles, arriving at the city of at 4.20 p.m.

On April 21, Squadron-Leader MacLaren left Baghdad at 9 a.m. for Basra, three other machines escorting him on his way. He reached Basra safely at 12.30 p.m., and left at 3.30 p.m. for Bushire, but owing to darkness a descent on to the sea had to be made only a few miles from their objective.

At daybreak, the following day, April 22, they continued their flight to Bushire. After a short stay here they resumed their journey as far as Bander Abbas, 405 miles from Bushire, arriving just before 4 o'clock.

The American team, consisting of four Douglas (400 h.p. "Liberty") biplanes led by Major F. L. Martin, who had got as far as Seward, Alaska, on April 13, resumed their journey on Wednesday, April 16. Major Martin, when in the neighbourhood of Kiakagvik—not far from Chignik, Alaska, experienced engine trouble and was forced to descend. The other three machines arrived safely at Chignik, having covered a distance of 450 miles. In the meantime Major Martin was rescued by the U.S. destroyer "Hull" in Portage Bay. The machine was towed to Kanatak Head in the bay, there to await a new engine from the dump at Unalaska—delaying the flight several days.

On April 19 the three machines at Chignik proceeded to the next halting place, Dutch Harbour, one of the Aleutian Islands, a distance of nearly 400 miles, where they arrived safely. Latest reports state that a furious blizzard, with the temperature of 20 deg. below zero, is sweeping over this part of the country, and is likely to delay further progress. In any case, the three pilots still in the "flying" probably intended waiting at Dutch Harbour until rejoined by their leader, Major Martin.

Respective mileage (approximate) completed to date—*American*, 3,050 miles; *British*, 4,100 miles.

FLIGHT
THE AIRCRAFT ENGINEER AIRSHIPS

TESTS ON RIVETED JOINTS IN SHEET DURALUMIN*

By H. F. RETTEW and C. THUMIN.

Introduction.—The following notes were taken fron a thesis by H. F. Rettew and C. Thumin, presented in June, 1921, to the Department of Mechanical Engineering, of the Massachusetts Institute of Technology.

The original thesis consisted of twenty-six tension tests on various forms of single-riveted lap-joints. Three thicknesses of duralumin sheet were used: ·020 in. and ·040 in. heat-treated, and ·095 in. annealed. The material was furnished, most of the riveting was done, and advice and assistance were freely given by the Engineering Division of the Army Air Service. In making the tests, the slippage of the joints was noted at three points across each joint. In addition, stress-strain curves were obtained for plain tension specimens, and a chemical analysis was made of the sheet. No analysis was made of the rivets, which, incidentally, were annealed duralumin, with heads formed before riveting.

Results and Conclusions.—The most surprising results of the work were the unusually high values of crushing and shear found to exist. These values are nearly double what is ordinarily found in shear or compression tests, and are apparently due to the friction of the riveted plates and the reinforcement of the rivet heads. Since this friction and reinforcement are necessarily present in all good riveted joints, the high strength values may properly be used in design.

Following are the values for riveted joints in heat-treated duralumin sheet:

	Commercial values	Values from Rettew and Thumin	Suggested values for design of joints
	lbs./sq. in.	lbs./sq. in.	lbs./sq. in.
Tearing (f_t) ..	55,000	54,000	50,000
Crushing (f_c) ..	45,000	105,000	100,000
Shear (f_s) ..	25,000	43,000	40,000

The recommended values for tearing and shear fall below all of the individual test values found by Rettew and Thumin, but certain specimens of crushing, where the variation was much larger, fell as much as 5 per cent. below the recommended value of 100,000 lbs./sq in. Nevertheless, 100,000 lbs. sq. in. appears to be a reasonably safe average figure.

From the recommended values a chart has been plotted (Fig. 1) based on the following formulas for rivet failure:—

Shearing

$$F = \pi d^2 f_s/4 = 31{,}400\ d^2 \text{ for single shear}$$
$$F = \pi d^2 f_s/2 = 62{,}800\ d^2 \text{ for double shear}$$

Crushing

$$F = td f_c = 100{,}000\ td$$

Tearing

$$F = (p-d)\ t f_t = 50{,}000\ t\ (p-d)$$

Critical rivet diameter

$$100{,}000\ td = 31{,}400\ d^2 \qquad d = 3{\cdot}2\ t$$

Double shear $d = 1{\cdot}6\ t$

Critical pitch

$$50{,}000\ t\ (p-d) = 100{,}000\ td,\ p = 3\ d$$

For double riveting, $50{,}000\ t\ (p-d) = 2\ (100{,}000 td)$

$$p = 5\ d$$

For triple riveting, similarly, $p = 7\ d$

d = driven diameter of rivet.
t = thickness of plate.
p = pitch of rivets, on centres.

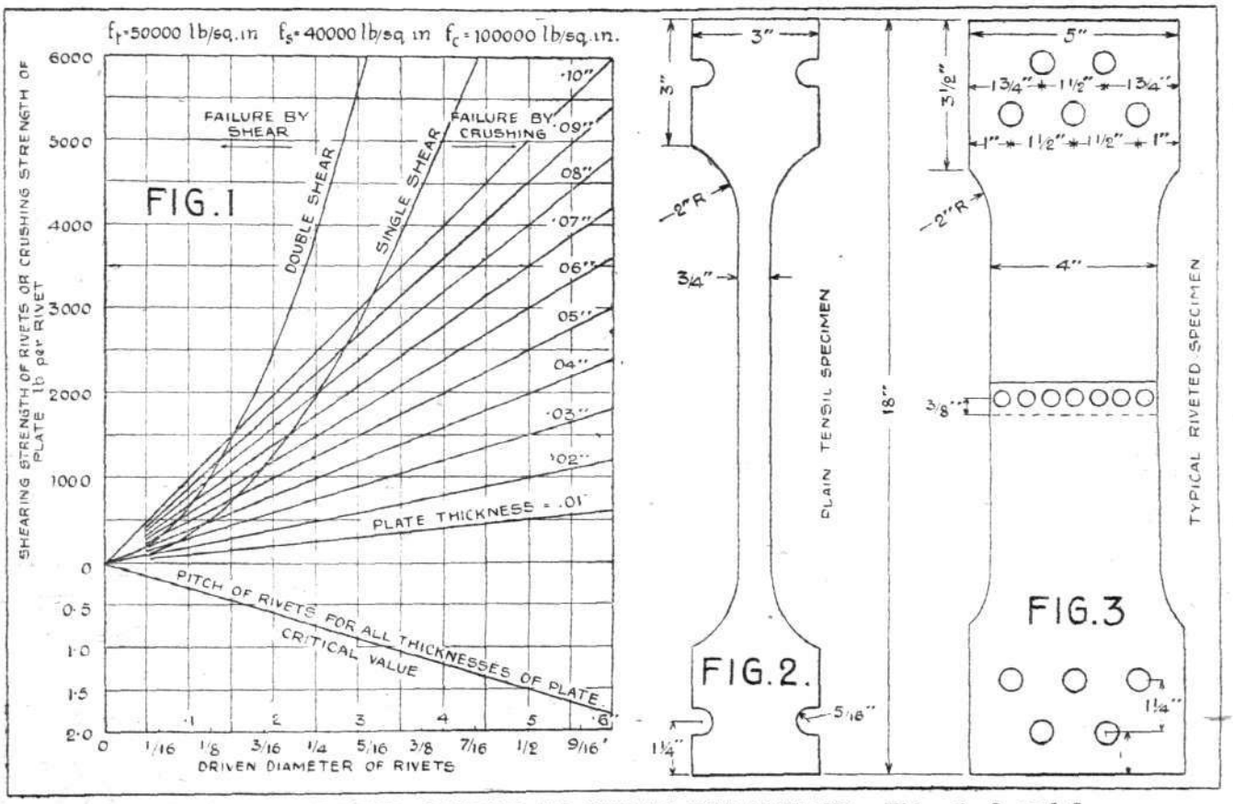
It is good practice to have the lap from 2·5 to 3 d and the distance between rows in double riveting (staggered) from 1 to 1·5 p.

In reading the chart one usually starts with the plate thickness, and follows that line along until it intersects one or other of the shear curves. This gives the critical rivet diameter. The nearest available rivet diameter is chosen (preferably larger) and the strength read off on the scale of ordinates at the left, the ordinate of the plate thickness line being used if the rivet diameter is above the critical figure, while the ordinate of the shear parabola is chosen if the diameter is below the critical. To find the pitch, read down from the chosen diameter, and take the nearest convenient pitch (larger than that given by the graph).

The tensile tests gave the following average results:—

	Heat-treated.		Annealed
Thickness (inches)	·020	·040	·095
Elongation in 8 ins. (per cent.)	12·67	19·53	12·55
Elongation in 2 ins. (per cent.)	14·83	24·25	17·75
Yield point (lbs./sq. in.) ..	27,800	26,100	13,750
Tensile strength (lbs./sq. in.)	56,530	56,625	31,750
Modulus of elasticity ..	11,310,000	11,020,000	9,773,000
Reduction of area (per cent.)	15·33	19·97	34·48
Ratio of Y.P. to T.S. ..	·491	·456	·437

* Extracts from Technical Note No. 165 of the National Advisory Committee for Aeronautics (U.S.A.).



TESTS ON RIVETED JOINTS IN SHEET DURALUMIN: Figs. 1, 2 and 3.

The riveted joints in the ·095 in. annealed sheet showed the following values in lbs. per sq. in.:—

$f_r = 32,700$ $f_s = 42,800$ $f_c = 62,300$

All of the tension failures both in the riveted joints and in the plain specimens occurred as shear along a 45° plane. The crushing failures appeared to be crushing of the plate and not of the rivets, although the plate, being heat-treated, has the higher theoretical strength of the two. The shearing failures were instantaneous, as opposed to the gradual distortion which preceded a failure by crushing or tearing.

The chemical analyses of the three thicknesses of sheet are given below :—

Thickness ins.	Cu.	Fe.	Si.	Mn.	Mg.
·020	4·21	·41	·26	·40	·82
·040	4·04	·38	·23	·38	·87
·095	4·16	·42	·26	·39	·82

Remainder, aluminium.

The only noteworthy result of the tests for slippage of the joints is that in all cases a redistribution of load takes place at the lower stresses, as is evidenced by the different amounts of slippage at differnet points along the joint. In general the slippage is small and unimportant.

Methods of Test.—The plain tensile specimens were tested in the usual manner. Owing to the thinness of the sheet and to the unevenness found in the smoothest of metal jaws it was necessary to use the peculiar form of specimen shown in Fig. 2. The notches cut at the ends were to receive plugs fitted into the testing machine jaws. Several of the more common types of ends were tried, but failure generally occurred in the jaws until the above was adopted.

The riveted specimens were made with 5 half-inch bolt holes in the end (Fig. 3) by which they were clamped into a pair of special jaws made without serrations. These jaws, in turn, were fastened into the testing machine. Slippage of the joint was noted by measuring the distance between two scribed lines under a magnifying lens.

Surveys from the Air

IN regard to the reported completion of the aerial survey of the Irrawaddy Delta in Burma—which has been carried out under the direction of Mr. Ronald Kemp, late Chief Inspector of Aircraft in India—Major H. Hemming, Managing Director of the Aircraft Operating Co., writes as follows :—

"The significant fact that 1,350 square miles have been successfully mapped from the air is of special interest to my company, as I was actually discussing the then proposed survey with my friend, Major Kennedy-Cockran-Patrick, on January 17 of this year. He left England on January 18 in order to do the actual photographic flying with Mr. Ronald Kemp, and now we hear that the survey is completed. The actual time taken from when Major Patrick sailed up to the time of your correspondent's report is under 12 weeks, and within that period he has travelled to Burma, the machines and instruments have been tested, and the survey completed —surely a feat reflecting the greatest credit on Mr. Kemp, Major Patrick, and all those associated with the work.

"It might be interesting to know how long it would take to survey the actual area by ground methods; probably the swampy and dense nature of the area would make a ground survey an impossibility. I understand that a fair estimate for this type of ground survey work is that it takes one man one day to survey a quarter square mile as regards the field work. Therefore, if three men were employed on this work on 28 working days per month, they would take approximately 5¼ years to do the field work for the area stated. One is assuming that outside the mechanic and photographic assistance Mr. Kemp is employing three experts, *i.e.*, the pilot, the observer, and the chief photographer; therefore, the comparison is most interesting. The feat is all the more interesting when it is considered that the work was carried out using old De Havilland type 9 aeroplanes, fitted out as seaplanes, and also the old type L.B. plate camera. With modern equipment far better results could be achieved.

"It is to be hoped that present results will drive home the value of aircraft for exploration and development to the various authorities, both at home and abroad, as well as to the business man."

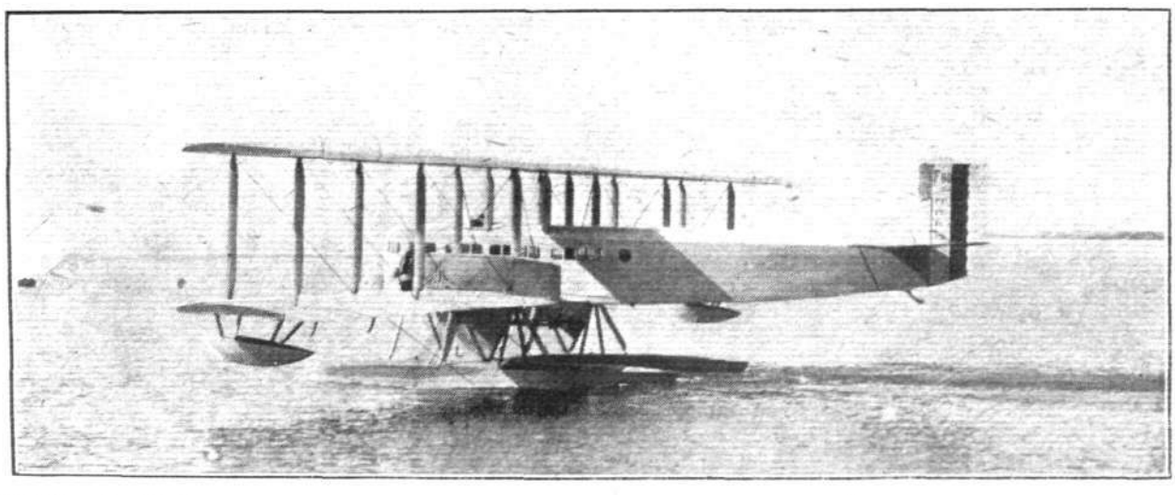
One of the two D.H. machines employed has practically done all the work, having flown a total of about 10,000 miles and exposed 3,000 photographic plates. The piloting work was carried out by Major Kennedy-Cockran-Patrick, and the photographic work was directed by Flying Officer Durward (lent by the R.A.F. in India.)

The Air Dispute

JUST as we go to press it is learned that, although no actual decision has been taken at the time of writing, there is hope of a settlement in the dispute between pilots and engineers on the one hand and Imperial Airways, Ltd., on the other. Both parties have very wisely refrained from making public any details of the negotiations during the last few days, but it is believed that a solution is about to be found, and we hope to be able to announce in next week's issue that an agreement satisfactory to both parties has been reached. One of the main points—the right of the pilots to have a voice in the matter of suitability for flying on any particular machine or under any given weather conditions—is believed to have been agreed to by the company, and it is firmly expected that the unfortunate deadlock will not for much longer delay the start of flying, which has now been suspended for nearly a month.

Curtiss-Reed Metal Airscrews in Europe

ARRANGEMENTS have now been completed for the manufacture under licence in Great Britain and France of the Curtiss-Reed Duralumin airscrews with which the Curtiss-Navy racers were fitted in the Schneider Race at Cowes last year. The concession for Great Britain has been acquired by the Fairey Aviation Company, of Hayes, Middlesex, while the French rights have been secured by Pierre Levasseur, 17, Place Felix-Faure, Paris. At present these are believed to be the only European rights disposed of. Until arrangements have been completed with other countries inquiries should be addressed to the Fairey Aviation Company.



A FRENCH RECORD-BREAKER : The Farman "Goliath" fitted with floats on which Georges Réné established a world's altitude record for seaplanes carrying a useful load of 1,000 kgs., at St. Raphael on April 4. In a flight lasting 1 hr. 20 mins. he reached an altitude of 3,300 m., thus beating the previous record of 2,432 m. made by E. Dolecek (U.S. Air Service) on an F-5-L flying boat. The above "Goliath" is fitted with two 230 h.p. C.U.Z.9 Salmson engines.

FLIGHT
AIRCRAFT ENGINEER AIRSHIPS

THE HANRIOT H-D-26 "SESQUIPLANE"

THE Hanriot H-D-26 is a single-seater chaser of all-metal construction, with the wings so disposed as to give the best possible range of vision for the pilot. Since this machine first made its appearance at the last Paris Aero Show in 1922 certain modifications have been introduced, principally in the construction of the main plane and the wing construction.

It is of the "Sesquiplane" semi-cantilever type, fitted with a 260 h.p. Salmson-type Z-9 engine. The upper plane, which is of thick section (Göttingen 430 ?), is in two units, mounted on the top longerons of the fuselage. It has two main spars of rectangular-section duralumin, and a false tubular spar on which the ailerons are mounted. Originally the wing had a single rectangular spar and two auxiliary tubular spars, one of which formed the leading edge. The ribs have also been modified, being of armoured-wood construction.

The small lower plane is also in two parts, and is attached to the lower longerons of the fuselage. It is built up of a single rectangular-section main spar and two tubular members, one located at the leading, and the other near the trailing, edge.

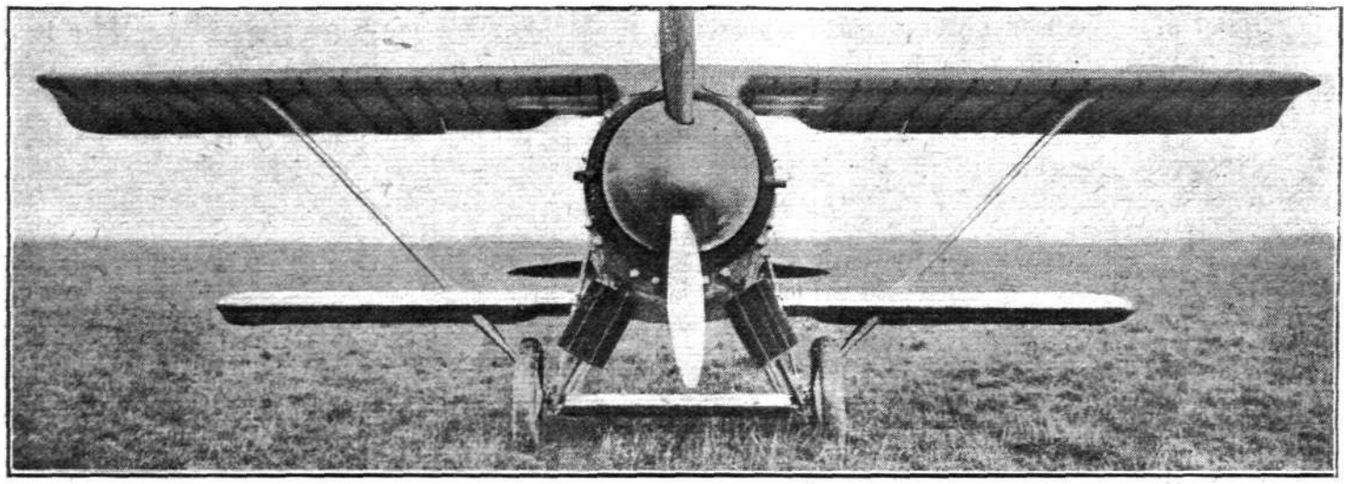
One of the main features of the wing arrangement in the latest model Hanriot H-D-26 is the entire absence of wire bracing. In the original model a single-lift cable ran from the rear strut of the under-carriage to the top plane at a slight outward angle, and in addition there was a single strut extending upwards from the axle of the under-carriage to the centre portion of the top plane. In the new model, however, a single strut takes the place of the lift cable.

The tail surfaces are built up of duralumin in a similar manner to the wings. Rudder and elevators are unbalanced.

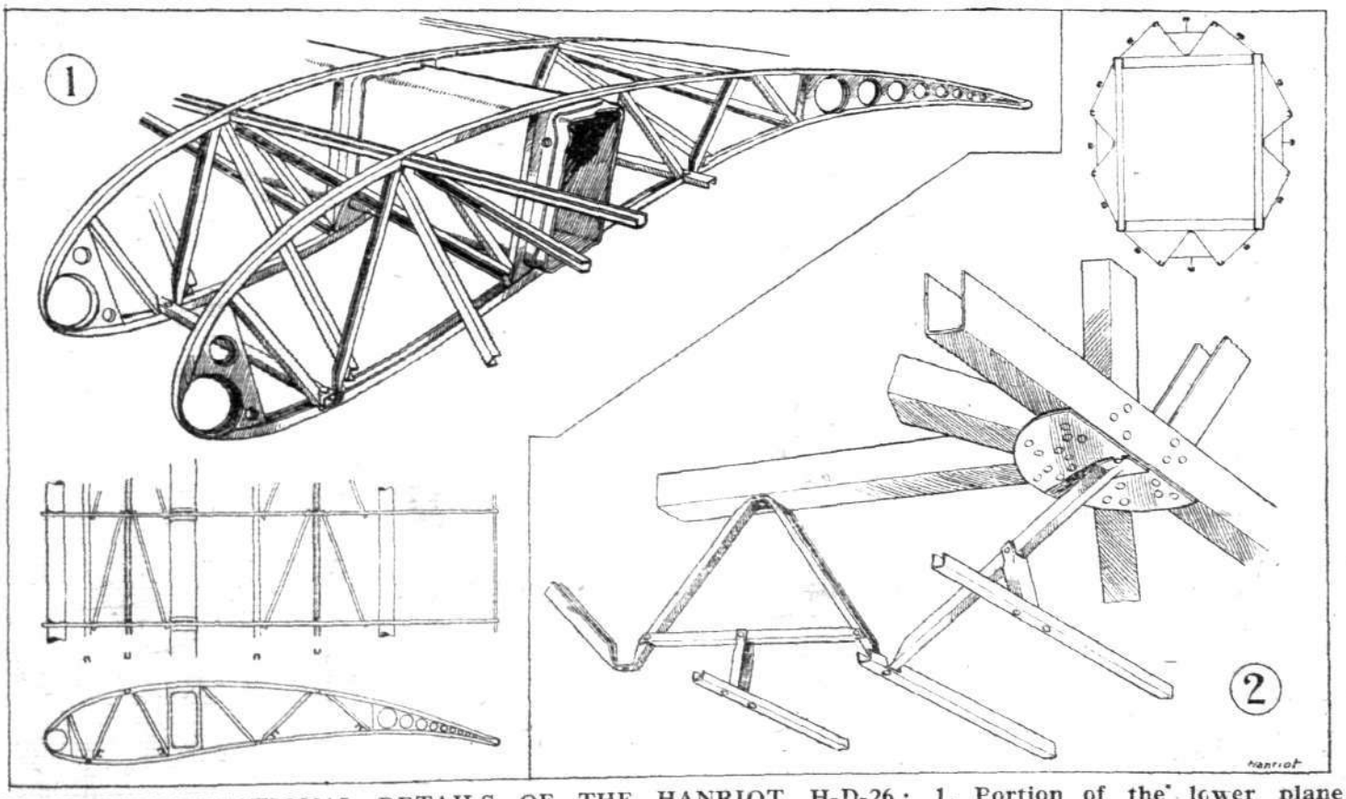
The fuselage is built up of four main longerons of channel-section duralumin, braced by channel-section cross and side members, Warren fashion. Light channel-section formers and stringers give the fuselage a streamline section.

The landing chassis is of the V-type with the addition of a strut each side extending upwards from the axle and attached to the front spar of the lower plane and to the top-plane attachment fitting. The V's are attached to the engine mounting and to the lower longerons of the fuselage. A small lifting plane, fairing the axle, is mounted between the V's.

The principal characteristics of the Hanriot H-D-26 are :— Span, 9 m. (29 ft. 6 ins.) ; length, 7 m. (23 ft.) ; wing area, 18 m.² (194 sq. ft.) ; weight fully laden, 1,150 kg. (2535 ·75 lbs.) ; weight per horse-power, 4 ·42 kg. (9 ·7 lbs.) ; wing loading, 60 ·5 kg./m². (12 ·4 lbs./sq. ft.).



THE HANRIOT H-D-26 "SESQUIPLANE" : A single-seater chaser of all-metal construction. The "plus fours" on the chassis struts are radiators.



SOME CONSTRUCTIONAL DETAILS OF THE HANRIOT H-D-26 : 1. Portion of the lower plane showing the single rectangular-section duralumin spar. 2. Fuselage construction ; the longerons, four in number, and the struts are channel-section duralumin.

A NOVEL TYPE OF TWO-STROKE

Multi-Cylinder Engine Without Blower

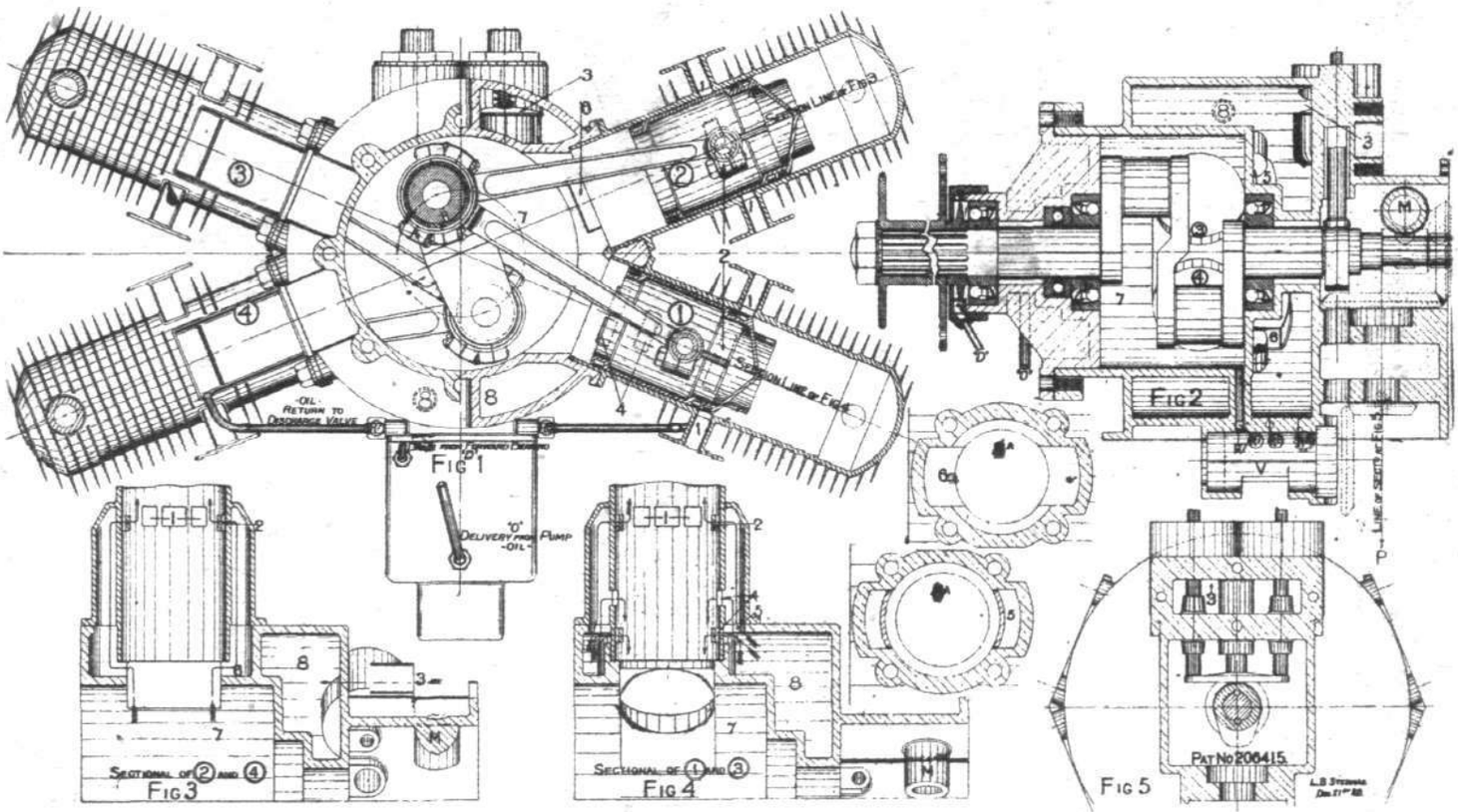
THE general simplicity of the two-stroke engine, and the low cost at which it can be produced, is not without its appeal when it comes to design power plants for light aeroplanes, where simplicity and cheapness are, perhaps, of greater importance than very low fuel consumption. After all is said and done, considering that the total cost of running a light 'plane will, in any case, be somewhat high, it does not really seem to matter a great deal whether a machine does 50 miles or 60 miles on a gallon of petrol, provided the power plant is of low first cost and cheap in upkeep. One obstacle to the adoption of the two-stroke, however, has been that the "ideal" type—a three-cylinder radial with crank-case compression—is not possible without the use of a blower If, on the other hand, a blower is added the cost goes up, and the simplicity of the plain two-stroke is largely lost.

A young inventor, Mr. L. B. Stedman, has invented and patented a novel type of two-stroke, in which be believes that, although the "ideal" has not been attained, a step towards it has been made. Briefly the Stedman engine, in its simplest form, consists of a Vee-twin, in which one cylinder draws its charge from the crank-case, while the other is supplied initially from the crank-case, but *via* a chamber surrounding the crank-case. In a slightly more elaborate form the engine is of flat X formation, two opposing cylinders being supplied from the crank-case, and the other two from the outer chamber.

Mr. Stedman would appreciate criticisms of his design, as if there is some serious "snag" in it he does not wish to continue working on it. On the other hand, if the design has a reasonable chance of success, he is anxious to secure the co-operation of a firm willing to undertake the manufacture and development of an experimental engine of small size on which his theories could be tested.

From the accompanying drawings it will be seen that the cylinders 2 and 4 draw their charge from the crank-case *via* the inlet ducts 6, while cylinders 1 and 3 are supplied from the surrounding chamber 8, which communicates with the crank-case until the openings are closed by the descending pistons. The cubic capacity of the crank-case 7 and the chamber 8 are so proportioned as to give an equal charge to all cylinders. The carburettors are mounted on the back of the engine, and it will be observed that spring-loaded valves are employed. There are two of these, as the chamber 8 is divided by a vertical partition. The exhaust ports are shown at 1.

Particular attention has been paid to the question of lubrication, and Mr. Stedman has evolved a system which he believes to be a considerable improvement in the lubrication of a two-stroke engine. The oil is delivered from a pump to the bearings through channels in the crankshaft, and surplus oil is returned to a discharge valve of special design, shown at V, Fig. 2. This discharge valve is in the form of a rotating cylinder, with a portion cut out. When the compression in the crank-case is at its maximum the solid portion of this cylinder covers the ends of the return pipes R7 and R8, and the charge is prevented from escaping. By suitable timing the cylinder can be made to bring its cut-away portion opposite the openings at a time when there is practically no compression, and thus, although the oil is enabled to drain past, no crank-case compression is lost.



THE STEDMAN TWO-STROKE ENGINE: The cylinders 2 and 4 draw their charge from the crank-case 7, while cylinders 1 and 3 are supplied from a chamber surrounding the crank-case. On descending, the skirt of the piston in 1 and 3 covers the ports 4, thus cutting off communication between the crank-case and the chamber 8.

Certain fairly obvious drawbacks in the Stedman design cannot be denied. Thus although the mechanical balance should be good, the firing impulses would occur unevenly, owing to the disposition of the cylinders. Probably this would not be a very serious matter in a small engine, as the ordinary Vee-twin four-stroke is not perfect in this respect either, yet does not give any trouble on this score. Secondly, although there are four cylinders, the number of impulses per revolution is but that of a four-cylinder four-stroke. For larger engines Mr. Stedman contemplates the addition of another unit behind the first one, with its cylinders at right angles (in front view) to those of the first unit. Whether his scheme for obtaining compression in the chamber surrounding the crank-chamber will be successful we are not prepared to say. Certain difficulties might be encountered, although the inventor is confident that he can obtain all the compression he needs. The engine should certainly be fairly cheap to make, with no valves, valve gear, etc., and if anyone interested will write to Mr. Stedman, c./o. the Editor, letters will be forwarded. As already mentioned, Mr. Stedman will welcome criticisms, and that these will not be lacking may, perhaps, be expected when it is pointed out that the inventor has in mind the application of his system to engines of the semi-Diesel type.

FLIGHT

THE "SWALLOW" 1924 THREE-SEATER COMMERCIAL BIPLANE

A NEW three-seater commercial biplane, produced by the Swallow Aeroplane Manufacturing Co., of Wichita, Kansas, has recently been put through its tests with satisfactory results.

The "Swallow" was designed with the following desirable commercial features in view:—Small overall dimensions, ease of control, low initial cost, low maintenence cost, and good all-round performance for a Curtiss OX 5 engine installation. It is a biplane of the two-bay type, the top plane being in three sections with the centre section supported above the fuselage by two pairs of struts, and the lower plane being in two sections, attached direct to the lower longerons of the fuselage. The wings are of conventional design, the spars being laminated and channelled inside, forming a very light and strong spruce box spar. The ribs are reinforced spruce with spruce cap strips. The internal bracing consists of four No. 9 wires in each panel. The control surfaces are built entirely of metal, the torsion members being steel tubing with steel ribs and duralumin trailing edge. The stabiliser is built up of spruce and is of the semi-cantilever type. Ailerons are fitted to both upper and lower planes.

There are no exposed control wires on this machine, the elevator cables, which are doubled, running directly from the control stick to the elevator horn working inside the fuselage. The aileron control cables run directly from the stick control torque tube to a 4-in. pulley in the wing, thence to the aileron horn. There are only four pulleys in the control system. It is stated that the aileron action is sensitive and positive, even under the roughest conditions.

The fuselage, of rectangular section, is of the conventional girder construction, with a detachable steel tube engine mounting. The passengers' cockpit, which is located forward behind the main planes—or, more correctly speaking, in line with the trailing edge—accommodates two passengers side by side, the seat being well upholstered, and measuring 32½ ins. wide. The pilot's cockpit is situated immediately behind, and large wind-shields are provided for both cockpits.

The 90 h.p. Curtiss OX 5 engine is well streamlined, and the radiator, weighing but 27 lbs., is mounted below the fuselage, between the chassis struts. The entire cooling system contains only 4 gals. of water, yet is claimed to cool sufficiently on the hottest days. Water temperature is controlled by means of shutters on the radiator. An aluminium petrol tank, holding 33 gals., is mounted inside the fuselage, while a reserve tank of 4 gals. capacity provides an extra half-hour's running.

A V-cum split axle type landing gear is fitted, giving a ground clearance of 20 ins. at the centre.

AN AMERICAN THREE-SEATER COMMERCIAL BIPLANE: The "Swallow," 1924 model, fitted with a 90 h.p. Curtiss OX5 engine.

The principal characteristics of the "Swallow" are as follows:—

Span	32 ft.
Chord	5 ft.
Area of main planes (total)	300 sq. ft.
Area of stabiliser	21 sq. ft.
Area of ailerons	34·8 sq. ft.
Area of elevator	16·6 sq. ft.
Area of rudder	8·2 sq. ft.
Area of fin	3·5 sq. ft.
Weight, empty	1,250 lbs.
Weight, fully laden	1,950 lbs.
Weight, per h.p.	21·6 lbs.
Weight, per sq. ft.	6·5 lbs.
Speed range	35–95 m.p.h.
Endurance (full speed)	4 hrs.
Ceiling	18,000 ft.

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BRISTOL "JUPITER" TEST

THE 400 h.p. radial air-cooled Bristol "Jupiter" engine has been recently submitted to a further type test, particulars of which we give below.

Engine No. 878 was chosen at random from a batch of fourteen completed engines awaiting test and delivery, and with no special preparation was mounted on the dynamometer, when power and consumption curves were taken. The engine was then mounted on the hangar, and a 20 hours' non-stop run at nine-tenths full power was completed, followed by three periods of ten hours' non-stop according to the approved schedule. At the end of each ten hours the engine was opened up to full throttle for a period of five minutes, except during the final period, when the last hour of the test was at full throttle.

It is a fact worthy of note that the power developed by the engine was appreciably higher at the conclusion of the tests, when a further power curve was taken, than it was in the beginning. When the first curve was taken the engine developed 398 b.h.p. at its normal revolutions of 1,575 p.m. —16 h.p. above its normal rating. At the same speed at the conclusion of the tests the engine was giving 399 b.h.p., having picked up 1 b.h.p. during the 50 hours. Similarly at maximum revolutions 1,750 p.m., the 424 b.h.p. developed at the beginning had increased to 430 b.h.p. during the final period—a gain of 6 b.h.p. The average fuel consumption throughout the endurance run was 0·59 pint per b.h.p./hour, and at full throttle was 0·582 pint per b.h.p./hour. These figures compare very satisfactorily with those recorded by the best engines of water-cooled type. The engine ran steadily and well throughout all periods of the test, and the distribution was excellent.

After the completion of the scheduled tests the engine was completely stripped, cleaned and examined, and was found to be in excellent condition.

IN PARLIAMENT

Helicopters

MR. HARDIE, on April 14, asked the Under-Secretary of State for Air whether he had decided what further is to be done with regard to the helicopter experiments; whether he intended to cause patents to be taken out in foreign countries; and whether he was aware that, even if the helicopter could do what the inventor claims for it, such services are already being carried out with other methods?

Mr. Leach: In reply to the first part of the question, I have nothing to add to the reply given to the hon. and gallant member for Clitheroe (Capt. Brass) on March 6. As regards the second part, the Air Ministry do not propose to take out foreign patents at the public expense, but the inventor has been given permission to take out such patents if he wishes to do so. With regard to the third part of the question, a successful helicopter should combine a number of functions which cannot be combined in any other type of aircraft.

R.A.F. Accidents

MR. B. SMITH asked the number of aeroplane crashes in the Royal Air Force from January 1, 1920, until March 31, 1924; how many officers and other ranks lost their lives in flying accidents in the force; and whether, in his opinion, sufficient care is exercised to prevent undue risk of accident and loss of life?

Mr. Leach: As regards the first part of the question, the flying accidents resulting in death numbered 120, and those resulting in injury only, 162. These figures include all accidents, whether in this country or overseas, and whether occurring in the course of operation or otherwise. As regards the second part, 128 officers, 1 cadet and 55 airmen were killed in the 120 fatal accidents. As regards the last part of the question, I am satisfied that every care is taken to eliminate risk of accident and loss of life so far as this is possible.

Civil Aviation Accidents

MR. B. SMITH asked the number of aeroplane crashes in civil aviation from January 1, 1920, till March 31, 1924; how many passengers, pilots and mechanics lost their lives; and whether, in the interest of public safety, it is proposed to introduce legislation providing for enquiry by a Government inspector in all cases where there is loss of life or injury following accidents when flying, as is done in the case of railway accidents?

Mr. Leach: On the assumption that by "aeroplane crashes" my hon. friend refers to British civil aviation accidents which resulted in death or injury to the occupants of the aircraft, the statistics for the period January 1, 1920, to March 31, 1924, are as follow:—

Crashes.

Fatal (*a*), 3; (*b*) 12. Non-fatal, but resulting in injury, (*a*) 4; (*b*) 19.

Casualties.

Killed—Pilots, (*a*) 4; (*b*) 12. Mechanics and other crew, (*a*) 2; (*b*) 1. Passengers, (*a*) 5; (*b*) 11.

Injured—Pilots, (*a*) 2; (*b*) 16. Mechanics, etc., (*a*) 2; (*b*) 1. Passengers, (*a*) 3; (*b*) 13.

(*a*) = On regular air transport routes and transport services.

(*b*) = In all other civil flying, including "joy-riding," competitions, tests, exhibitions, etc.

In answer to the last part of the question, in accordance with the powers given by Section 12 of the Air Navigation Act, 1920, to make regulations providing for the investigation of air navigation accidents, the Secretary of State for Air made, on June 28, 1922, the Air Navigation (Investigation of Accidents) Regulations.

R.A.F. Accidents

MR. A. T. DAVIES, on April 16, asked the Under-Secretary of State for Air whether his attention has been directed to the relatively increasing number of aeroplane accidents in the Royal Air Force during the past year; whether he is aware that the number of accidents to aeroplanes engaged in civil aviation over that period for miles flown is much smaller than those which have occurred in the Royal Air Force during a similar period; whether the Ministry has had under consideration for the purposes of report the cause of accidents to aeroplanes engaged both in the Royal Air Force and in civil aviation; whether he is aware that investigation tends to show that an appreciable and greater number of accidents in the Royal Air Force have occurred through the inexperience of their pilots contrasted with those employed in civil aviation; and that this has been proved by the faulty running of the Royal Air Force engines, and what was the number of accidents, lives lost and men injured in the Royal Air Force during the year ending March 31 last?

Mr. Leach: As regards the first part of the question, it is not the case that the number of aeroplane accidents in the Royal Air Force has been relatively increasing during the past year. On the contrary, the number of fatal or serious accidents has largely decreased relatively to the number of hours flown.

As regards the second part of the question, it is not possible to institute a comparison between Royal Air Force and civil flying on a basis of miles flown, the basis on which flying is computed in the Royal Air Force being one of hours and not of miles. A comparison on the basis of miles flown would in any case be quite misleading, since accidents are much less likely to occur as the result of the comparatively small number of long and straight flights carried out for the purposes of commercial transport than as the result of the very large number of shorter flights carried out by service aviators in training or manœuvres.

As regards the third part of the question, every serious flying accident and all accidents of which the causes are in any way obscure, whether happening to Royal Air Force or civil aircraft, are investigated by the Accidents Investigation Branch, which directs special attention to ascertaining the causes and makes a report on which action is taken to prevent the recurrence of accidents from the same causes in future. In the case of Royal Air Force flying accidents, a Service Court of Inquiry is held in addition.

As regards the fourth part of the question, I am not aware on what evidence the statement made is based, but it is obvious that when inexperienced pilots are being taught to fly the risk of accident is greater than when experienced pilots are flying standard machines on commercial flights over well-known routes. Practically every pilot employed in civil aviation at present was trained by Service aviation.

As regards the fifth part of the question, the engines of Royal Air Force aeroplanes are subject to continual overhauls and tests by experienced mechanics under the supervision of technical officers, and only a very small proportion of the accidents which have occurred have been found to be due to engine failure.

As regards the sixth part of the question, the number of serious flying accidents in the Royal Air Force during the year ending March 31, 1924, was 87, resulting in 55 deaths and injuries to 87 officers and airmen.

Air Ministry

LIEUT.-COLONEL MOORE-BRABAZON asked the Under-Secretary of State for Air whether he is aware that, owing to the action of the permanent members of the staff side of the Departmental Whitley Council, the temporary staff in the Department is not represented on the Council, and, as a result of this action, the temporary staff are practically disenfranchised for Whitley Council purposes; and, if the official side is not prepared to insist on the inclusion of the representatives of the temporary staff, whether he will set up separate machinery by which the temporary staff may raise matters concerning their terms of service, etc.?

Mr. Leach: In answer to the first part of the question, it is unfortunately true that a portion of the temporary staff is not at present represented upon the Departmental Whitley Council, owing to its being organised in an association which excludes certain members of the grades which it purports to represent.

As regards the second part of the question, the matter is one primarily for the staff side to settle, and I understand that it is now in at fair way to be adjusted; the suggestion for separate machinery has been considered, and could not be agreed to.

Lieut.-Colonal Moore-Brabazon asked the Under-Secretary of State for Air whether he is aware that many temporary officers in his department are compelled to accept liability for flying duties without any extra pay or emoluments; and whether, in view of the fact that flying risk necessitates a large addition to insurance premiums, he will undertake to investigate the position with a view to granting special allowances in every case where an officer is liable to undertake flying duties?

Mr. Leach: As regards the first part of the question, I am aware that the duties of the officials of the Research and Inspection Departments necessitate their going into the air, but this liability was taken into account when their emoluments were fixed, and is expressly mentioned in their contract of service as entitling them to no additional allowance. As regards the second part of the question, I cannot undertake to grant a special allowance for a liability which is thus part of the contract of service, and which, moreover, is already covered to the extent that compensation is granted under the Superannuation Act, 1887, in the event of death or injury from a flying accident on duty.

Air Armaments

MAJOR-GENERAL SEELY asked whether the Prime Minister could see his way to take some steps towards the limitation if air armaments, to stop the mad race which was now beginning, and which, if not stopped, would result in a catastrophe to civilisation the like of which mankind had never seen.

We had started an air race against France which was being joined in by others. Great armaments tended to make great antagonisms. He believed that there was no more humane way of maintaining order among savage tribes than the aeroplane, because the use of air power was generally for dropping warnings, which were only in rare cases followed by dropping bombs. But in the case of civilised countries air warfare was the most cruel and deadly ever devised. He appealed to the House to face the facts, and try to follow up the suggestion of the late Prime Minister—or, rather, he was glad to say, the ex-Prime Minister. It was said that they could not limit air armaments, because civil aviation provided a large reserve of war machines which no one would know anything about. The answer to that was that the vast expansion of civil flying which was prophesied had not come, and would not come, till aeroplanes were far different from what they now were.

If they came to an agreement in this matter, as hey had in regard to the Navy at Washington, surely they might trust to frank disclosure of the facts. He suggested the desirability of summoning a conference of all the Powers concerned, or even of only two. In that way both England and France might be equally safe, and far richer, not only in money, but in the good will between the two countries.

Lieut.-Commander Kenworthy said that Major-General Seely did not speak for every one behind him in what he had said about the humane methods of air attacks on savages.

Mr. MacDonald, Prime Minister, said: We have listened to a very interesting speech by my hon. and gallant friend, and I can assure him that if I can do anything to help in any way to make it an important speech I shall be very glad.

I have at the back of my mind—and not very far at the back—the intention that, as soon as we clear away some of the present difficulties of Europe, we must face quite seriously this question of armaments—not only air armaments, but all other forms. I do not know how far my hon. and gallant friend has been "talking from the book," but if I felt that there was the least chance of receiving a welcome should I make such a proposal as he has indicated, I am prepared to do it. I will put it in another way, and I am quite sure that the House is with me in this—that if any invitation is extended to me by any other Power to help in bringing about such an arrangement, my door is open.

It is of the greatest importance that there should be no reason for misunderstanding—not merely no reason for a quarrel, but no reason for misunderstanding between France and ourselves. But, as my hon. and gallant friend knows, there are other Powers that are taking steps in this unfortunate air race that has already begun, and I think it would be far better if we could manage to get a sort of Washington Agreement—not merely a bi-lateral but a multi-lateral, agreement—so that every one should feel some measure of security.

The great problem of disarmament is not good will. It is the problem of security, and security is mainly a psychological problem. If we cannot persuade people they are secure then they would not feel secure, and you can persuade people they are secure when, as a matter of fact, they are taking steps to smash up any security they might have. Therefore, what the poor diplomatist has got to do is not only to meet public opinion, but to meet a similar body of sane men who really know what the real problem of security is, and get them—representatives of every nation concerned—to take wise steps and to explain those steps to their own people so that there will be an international feeling of security which will open the door to the arrangements that my right hon. and gallant friend has sketched. I do not think I need say anything more. It is a matter that has to be considered in details. Inquiries will have to be made. But he knows all that even better than I do.

All I can say, and I say it without reserve, with all my heart, is that I am exceedingly obliged to him for having opened up this question today, and so far as I am concerned, it will be a great pleasure if I can carry on the idea of—I am very glad to say, not "the late" Prime Minister I will do my best to keep him "ex" as long as I can—but I would never lift my little finger to make him "the late" Prime Minister, and it will be a great pleasure to me if I am assured of the hearty co-operation of all sections of the House in doing something to advance the intentions which prompted my right hon. and gallant friend in making his speech.

FLIGHT

THE ROYAL AIR FORCE

London Gazette, April 8, 1924

General Duties Branch

The following are granted permanent commissions in ranks stated with effect from dates indicated :—Sqdn. Ldr. W. H. de W. Waller, A.F.C. ; April 9. Flying Offr. W. N. Plenderleith ; March 24. The following are granted short service commns. as Flying Offrs., with effect from, and with seny. of, the dates indicated :—A. Haines ; March 27. H. J. Gearing ; April 1. The following are placed on half-pay, Scale B ; March 25 :—Sqdn Ldr. A. S. C. Maclaren, O.B.E., M.C., D.F.C., A.F.C. ; Flying Offr. W. N. Plenderleith. Flt. Lieut. B. J. W. Brady, D.S.M., is restd. to full pay from half-pay ; April 3. Flying Offr. H. A. Argles resigns his short service commn ; April 9. Flying Offr. J. V. Ould relinquishes his short service commn. on acct. of ill-health, and retains his rank ; April 9. Pilot Offr. W. T. D. Windham relinquishes his short service commn. on acct. of ill-health contracted in the service ; April 9.

Stores Branch.

Flying Offr. G. Bucknall resigns his short service commn. ; April 9. Flying Offr. R. Blackith relinquishes his short service commn. on acct. of ill-health, and retains his rank ; April 9.

Reserve of Air Force Officers

The following are granted commns. on probn. in General Duties Branch in ranks stated (April 8) :—

Class A.—Flying Officer.—H. G. Brackley, D.S.O., D.S.C. *Pilot Officer.*—H. Kirk.

Flying Offr. D. A. Parrott is transferred from Class B to Class C ; April 6. Pilot Offr. G. W. Perks is transferred from Class A to Class C ; July 4, 1923. The following Flying Offrs. on probn. are confirmed in rank with effect from the dates indicated :—J. C. Joynt ; March 18. C. T. Holmes ; April 8.

Erratum.—Gazette of March 25, page 2,535, for W. F. Humphrey read W. F. Humphery.

London Gazette, April 15, 1924

General Duties Branch

G. Rose is granted a short service commn. as Flying Offr., with effect from, and with seny. of, April 7. Pilot Offr. C. Guppy is promoted to rank of Flying Offr. ; April 6. Flight Lt. R. W. G. West is placed on retd. list on account of ill-health ; April 16. Flight Lt. G. N. Humphreys is transferred to Reserve, Class C ; April 24, 1923 (substituted for *Gazette*, April 24, 1923). Flying Offr. R. E. Baugh resigns his short service commn. ; April 16.

Stores Branch

R. V. Robinson (temp. Capt. I.A.R.O.) is granted a short service commn. as Flying Offr. for three years on active list, with effect from April 15, 1924, and with seny. of March 10, 1919.

Medical Branch

F. T. Boucher is granted a short service commn. as Flight Lt., with effect from, and with seny. of, April 2.

Reserve of Air Force Officers

W. Armstrong, A.F.C., is granted commn. in Class A, General Duties Branch, as Flying Offr. on probation ; April 15. The follg. officers are confirmed in rank, with effect from dates indicated : *Flying Officer.*—C. E. C. Rabagliati, M.C., A.F.C. ; March 29. *Pilot Officer.*—J. D. Parkinson ; April 9.

Pilot Officer F. E. Watts resigns his commn. ; March 24. The commn. of Pilot Officer on probation R. G. Spencer is terminated on cessation of duty ; Feb. 16. Flying Officer L. W. Lowen is transferred from Class A to Class B ; Jan. 7.

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified :—

General Duties Branch

Squadron Leaders : J. Leacroft, M.C., to No. 17 Sqdn., Hawkinge. 1.5.24. V. S. Brown to Aircraft Depot, Egypt. 1.4.24.

Flight Lieutenants : D. H. Dabbs, to No. 32 Sqdn., Kenley. 23.4.24. A. F. Somerset-Leeke, to Engine Repair Depot, Egypt. 26.3.24. F. G. Stammers, O.B.E., to H.Q., India. 11.4.24. H. W. Woollett, D.S.O., M.C., to H.Q., Egypt. 31.3.24. F. St. J. Woollard, A.F.C., to No. 216 Sqdn., Egypt. 31.3.24. A. R. M. Rickards, A.F.C., to No. 2 Armoured Car Co., Palestine. 31.3.24. F. H. E. Reeve, to H.Q., Palestine. 31.3.24.

Flying Officers : F. G. A. Robinson, to No. 4 Sqdn., S. Farnborough. 1.5.24. C. Ayling, to No. 11 Sqdn., Bircham Newton. 16.4.24. H. C. Bobbett, to Air Ministry. 23.4.24. H. Stafford, to Armament and Gunnery Sch., Eastchurch. 1.5.24. K. L. Boswell and E. A. Healy, to Aircraft Depot, India. 11.4.24. J. P. Huffam, V.C., and H. P. F. Fagan, to No. 55 Sqdn., Iraq. 5.3.24. H. J. M. Berthon, to R.A.F. Base, Leuchars. 1.5.24. H. R. B. Howell, G. McClintock, L. W. H. Phillips and F. P. Smythies, to No. 2 Flying Training Sch., Duxford. 1.5.24. E. T. O'N. Hogben, J. R. Bowring, M.C., S. P. George, J. B. Knocker, and H. V. Smith, D.C.M., to School of Army Co-operation, Old Sarum. 1.5.24.

Stores and Accountants' Branch

Flight Lieut.—W. Thorne, to H.Q., Palestine. 2.4.24.

Flying Officers.—H. N. Stevens, to No. 1 Stores Depot, Kidbrooke. 1.5.24. G. W. Sturman, to H.Q., Cranwell. 2.5.24. W. H. Bowden, to No. 17 Sqdn., Hawkinge. 21.4.24. F. A. Skoulding, to Boys' Wing, Cranwell. 23.4.24. A. J. Redman, D.F.C., to H.M.S. *Pegasus*. 21.3.24. W. W. Deane, to No. 12 Sqdn., Andover. 24.3.24. R. C. Clayton, to No. 2 Sqdn., Manston. 24.3.24. C. G. Bull, to Schl. of Balloon Training, Larkhill. 11.4.24.

Medical Branch

Flight Lieuts.—T. L. P. Harries, M.B., to R.A.F. Depot (Non-effective Pool). 14.3.24. J. J. Clarke, to H.Q., India. 4.4.24.

Flying Officer.—W. J. Hutchinson, M.B., to H.Q., India. 4.4.24.

NOTICES TO AIRMEN

List of Notices Operative and Cancelled

1. THE following Notices to Airmen are still operative :—

Year 1920.—Nos. 2, 17, 35, 49, 51, 52, 70, 73, 77, 78, 92, 95, 98, 102, 104, 105, 111, 117, 118, 119, 120, 121, 125, 126, 127, 128, 129, 130, 133, 139.

Year 1921.—Nos. 3, 4, 8, 9, 10, 12, 13, 18, 23, 29, 36, 37, 41, 46, 47, 48, 52, 54, 55, 57, 59, 64, 65, 66, 68, 70, 72, 74, 78, 83, 84, 85, 90, 95, 97, 99, 101, 102, 105, 106, 110.

Year 1922.—Nos. 2, 4, 5, 6, 7, 8, 10, 14, 18, 19, 20, 21, 23, 24, 25, 26, 28, 32, 34, 36, 38, 39, 40, 41, 42, 44, 47, 48, 49, 51, 55, 56, 57, 58, 61, 63, 64, 66, 67, 69, 70, 71, 72, 73, 74, 76, 78, 79, 80, 82, 83, 84, 85, 87, 89, 91, 92, 93, 95, 96, 98, 99, 100, 102, 103, 104, 109, 110, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 126, 127, 128, 129, 130, 131, 132, 134, 135, 136, 137, 138, 139, 140, 141.

Year 1923.—Nos. 3, 4, 5, 6, 7, 9, 10, 11, 14, 16, 17, 19, 21, 22, 23, 24, 25, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 38, 40, 46, 47, 48, 49, 52, 53, 54, 55, 56, 57, 58, 59, 60, 62, 64, 65, 66, 67, 68, 69, 71, 73, 74, 75, 76, 77, 78, 82, 83, 85, 86, 87, 89, 90, 91, 92, 95, 96, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108.

Year 1924.—Nos. 1, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22.

2. The following Notices, which have either ceased to operate or have fulfilled their purpose of cancelling other Notices, are cancelled and should be withdrawn :—

Year 1920.—Nos. 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 50, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 71, 72, 74, 75, 76, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 93, 94, 96, 97, 99, 100, 101, 103, 106, 107, 108, 109, 110, 112, 113, 114, 115, 116, 122, 123, 124, 131, 132, 134, 135, 136, 137, 138, 140, 141.

Year 1921.—Nos. 1, 2, 5, 6, 7, 11, 14, 15, 16, 17, 19, 20, 21, 22, 24, 25, 26, 27, 28, 30, 31, 32, 33, 34, 35, 38, 39, 40, 42, 43, 44, 45, 49, 50, 51, 53, 56, 58, 60, 61, 62, 63, 67, 69, 71, 73, 75, 76, 77, 79, 80, 81, 82, 86, 87, 88, 89, 91, 92, 93, 94, 96, 98, 100, 103, 104, 107, 108, 109, 111.

Year 1922.—Nos. 1, 3, 9, 11, 12, 13, 15, 16, 17, 22, 27, 29, 30, 31, 33, 35, 37, 43, 45, 46, 50, 52, 53, 54, 59, 60, 62, 65, 68, 75, 77, 81, 86, 88, 90, 94, 97, 101, 105, 106, 107, 108, 111, 122, 123, 124, 125, 133.

Year 1923.—Nos. 1, 2, 8, 12, 13, 15, 18, 20, 26, 37, 39, 41, 42, 43, 44, 45, 50, 51, 61, 63, 70, 72, 79, 80, 81, 84, 88, 93, 94, 97, 98.

Year 1924.—Nos. 2, 6.

The Halton Magazine

WE have received No. 1, Vol. 1 (Easter, 1924) of *The Halton Magazine*, the first number of the official "House" journal of Halton Camp, the great Royal Air Force training centre for Aircraft apprentices. Having seen for ourselves, a little while back, the organisation, etc., of Halton Training School, we are not surprised that this first journalistic effort is entirely in harmony with the former—in other words, the quality of this journal is excellent. It has been instituted with the object of developing literary and artistic talent amongst the aircraft apprentices, as well as providing the latter with a not unwanted medium for recording the results of the many and various sports and games which have been and are so keenly contested between the flights, squadrons, sections, etc., and also providing them with "something to read." In the words of the Editor, "it seeks to portray Halton in every mood—Halton the care-worn, Halton the care-free ; Halton the grave, Halton the gay ; Halton." With one or two exceptions all the contributions—other than official notes—are, and will be, from the Halton boys themselves : in this first number, we are told, mainly from the younger boys, for the seniors are in the throes of their passing-out School Examination. Well, if the youngsters can turn out material like that found in No. 1, we may expect great things when the seniors get going.

Air Vice-Marshal F. R. Scarlett, C.B., D.S.O., who has just relinquished the command of Halton Camp, writes a foreword to this first number, in which he wishes the magazine every success—a wish we heartily endorse.

The Halton Magazine will be published at the end of each term—*i.e.*, Easter, Summer and Christmas—and the price per copy is 6*d.*, or 1*s.* 6*d.* per annum (2*s.* post free).

IMPORTS AND EXPORTS, 1923-1924.

AEROPLANES, airships, balloons and parts thereof (not shown separately before 1910). For 1910 and 1911 figures see "FLIGHT" for January 25, 1912; for 1912 and 1913, see "FLIGHT" for January 17, 1914; for 1914, see "FLIGHT" for January 15, 1915; for 1915, see "FLIGHT" for January 13, 1916; for 1916, see "FLIGHT" for January 11, 1917; for 1917, see "FLIGHT" for January 24, 1918; for 1918, see "FLIGHT" for January 16, 1919; for 1919, see "FLIGHT" for January 22, 1920; for 1920, see "FLIGHT" for January 13, 1921; for 1921, see "FLIGHT" for January 19, 1922; for 1922 see "FLIGHT" for January 18, 1923; and for 1923, see "FLIGHT" for January 17, 1924.

	Imports.		Exports.		Re-Exports.	
	1923.	1924.	1923.	1924.	1923.	1924.
	£	£	£	£	£	£
Jan. ..	466	2,213	60,079	52,239	280	2,219
Feb. ..	641	920	120,236	26,349	3,040	335
Mar. ..	589	11,381	71,945	34,113	689	509
	1,696	14,514	252,260	112,701	4,009	3,063

SOCIETY OF MODEL AERONAUTICAL ENGINEERS

Research Competition for Self-righting Model Aeroplanes

THIS competition is only open to members of the S.M.A.E. or of affiliated clubs. Three prizes are offered—1st, £2 2s.; 2nd, £1 1s.; 3rd, 10s. 6d.

Rule 1.—Competitor's models must be fusilage gliders designed similar to possible full-sized tractor aeroplanes.

Rule 2.—Models should weigh exactly 4 ozs. and have a loading of 4 ozs. per sq. ft. of supporting surface. Any slight deviation from these weights will only be permitted at the discretion of the judges.

Rule 3.—Models must first be glided from the position chosen for dropping, the judges to decide whether the models are in correct flying trim, a *sine quâ non*.

Rule 4.—Any purely automatic self-righting device may be employed which, in the opinion of the judges, will be applicable to full-sized machines. Any such device to be in operation during the trial glide.

Rule 5.—The models in the actual test will be released vertically downwards from a height of between 20 and 30 ft. by a mechanical device manipulated by the competitor or by any other person appointed by the judges. The winning model to be the one which, in the opinion of the judges, recovers flying equilibrium in the least vertical distance without stalling afterwards.

The competition to be held on one Saturday in September, the exact date and place to be arranged later.

Country members are invited to send their models to the Secretary of the Research Committee, who undertakes to see them put through the test properly.

W. E. EVANS, *Hon. Sec. Research Committee*

SIDE-WINDS

THE Marconi stand at Wembley, which is situated in Avenue 11, Bays 9-11, in the Electrical Engineering Section of the Palace of Engineering, contains a great variety of exhibits representing the latest developments and appliances in all branches of wireless science. The stand is shared by Marconi's Wireless Telegraph Co., Ltd., the Marconi International Marine Communication Co., Ltd., the Marconiphone Co., Ltd., and the Marconi Scientific Instrument Co., Ltd. The most prominent feature of the stand is the model of a wireless beam transmitter which, as it revolves, sends out a certain Morse letter for every two points of the compass. These signals are picked up by a special receiving apparatus, independent of the ship's ordinary W/T installation, which does not require any skilled operation. By taking a succession of readings at intervals the ship's course can accurately be charted. Three types of aircraft transmitters and receivers, as fitted to the aeroplanes operating the principal air routes, are also included amongst the exhibits.

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IT may be of interest to note in connection with the world flights that all machines, both British and American, are provided with "Tabloid" first-aid equipments supplied by Burroughs Welcome and Co.

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A FULL range of B.T.H. aircraft magnetos—for 8, 9, 12 and 14-cylinder engines—are included in the extensive exhibit of the British Thomson-Houston Co., Ltd. (Rugby), at the Wembley Exhibition, in the Palace of Engineering.

Rolls-Royce, Ltd.

PRESIDING over the seventeenth annual meeting of Rolls-Royce, Ltd. (a summary of the directors' report was published in FLIGHT for April 3 last), Lord Wargrave stated that orders received and in prospect for aero engines and aero-engine parts promised to show a bigger turnover than last year. The Condor engines, 650 h.p., had passed the Air Ministry's airworthy test, and these engines were already being made for the British Air Service. This was another instance of Mr. F. Henry Royce's genius, and the excellent work of his technical assistants and experimental and works staff and the men who carried out his ideas.

In addition to orders from His Majesty's Government, the company's foreign aero business continued to expand, and they were at present carrying out important contracts for the Dominions, foreign governments, and for transport companies at home and abroad. These orders might be attributed to the world-famed reliability of Rolls-Royce aero engines which had been successfully used in many long-distance flights.

PUBLICATIONS RECEIVED

International Air Congress Report. London, 1923. International Air Congress, 7, Albemarle Street, London, W. 1.

Mūsu Zinynas. Vol. VI. No. 16. Karo Mokslo Skyrius, Kaunas.

Aeronautical Research Committee, Reports and Memoranda. No. 886 (Ae. 117).—Further Experiments on Tandem Aerofoils. By W. L. le Page. May, 1923. London: H.M. Stationery Office, Kingsway, W.C. Price 1s. net.

Technical Notes: *No.* 168.—Experiments with Fabrics for Covering Airplane wings. By A. Proll. December, 1923. *No.* 169.—Air Resistance Measurements on Actual Airplane Parts. By C. Wieselsberger. November, 1923. *No.* 170.—Reduction in Efficiency of Propellers Due to Slipstream. By Max M. Munk. December, 1923. *No.* 171.—Compressive Strength of Tapered Airplane Struts. By V. Lewe. December, 1923. *No.* 172.—The Nichols Wing-Cutting Equipment. By J. B. Ford. December, 1923.—*No.* 173.—Significance of the Expression $C_L^3 \; C_D^{-2}$. January, 1924. *No.* 174.—Airplanes in Horizontal Curvilinear Flight. By H. Kann. January, 1924. *No.* 175.—Tests on a Model of the D Airplane T 39 of Deutsche Flugzeug Werke. By W. Molthan. January, 1924. *No.* 176.—Curvilinear Flight of Airplanes. By E. Salkowski. January, 1924. *No.* 177.—Note on the Relative Effect of the Dihedral and the Sweep Back of Airplane Wings. By Max M. Munk. January, 1924. *No.* 178.—Triplane Tests. By W. Wieselsberger. February, 1924. *No.* 179.—Practical Method for Balancing Airplane Moments. By H. Hamburger. February, 1924. U.S. National Advisory Committee for Aeronautics, Washington, D.C., U.S.A.

AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: cyl. = cylinder; I.C. = internal combustion; m. = motor
The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

APPLIED FOR IN 1922

Published April 17, 1924

24,956. SIR E. H. T. D'EYNCOURT and others. Aircraft-carrying vessels. (212,951.)
25,055. J. A. HUGHES. Aircraft wings. (212,952.)
34,838. LORD INVERNAIRN (W. BEARDMORE) and A. E. L. CHORLTON. Supporting planes for flying-machines. (212,993.)

APPLIED FOR IN 1923

Published April 10, 1924

9,814. DORNIER METALLBAUTEN GES. and C. DORNIER. Flying-machines. (196,281.)
20,957. SOC. ANON. DES ATELIERS D'AVIATION L. BREGUET. Means for supplying combustible mixture to I.C. engines. (203,318.)

Published April 17, 1924

6,078. H. L. PENFOLD. Petrol tanks for aircraft. (213,092.)
8,057. J. W. GILLIE and F. H. ALEXANDER. Clinometers. (213,111.)
22,150. FAIREY AVIATION CO., LTD., and C. R. FAIREY. Shock-absorbing apparatus. (213,191.)

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